PATENT

Attorney Docket No. 64677
Date: August 8, 1997

THE ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

Transmitted for filing herewith is the patent application of:

Inventor(s): Dale Hunsberger, Julie Harwath and Frank Harwath

For: SOUND ATTENUATING MOTOR END SHIELD

This new application is for : ☒ Original ☐ Continuation ☐ Divisional ☐ Continuation-In-Part ☐ Design ☐ Plant

Enclosed are:

☒ Three (3) sheet(s) of drawings.

☐ an assignment of the inventor(s) to , along with the $40.00 assignment fee.

☐ a certified copy of application no. filed .

☒ a Combined Declaration and Power of Attorney executed by the inventor(s).

☒ Verified Statement that this is a filing by a small entity under 37 CFR 1.9 and 1.27.

☐ Preliminary Amendment.

☐ Information Disclosure Statement with Form PTO-1449.

☐ Submission of Sequence Listing.

☐ Other:

The fee has been calculated as follows:

	(Col. 1)	(Col. 2)	SMALL ENTITY		OTHER THAN A SMALL ENTITY		DESIGN FEES	
FOR:	NO. FILED	NO. EXTRA	RATE	FEE	RATE	FEE	SMALL	LARGE
BASIC FEE				$ 385		$ 770	$ 160	$ 320
TOTAL CLAIMS	19 -20=	* 0	x 11=	$ 0	x 22=	$		
INDEP CLAIMS	3 - 3=	* 0	x 40=	$ 0	x 80=	$		
☐ MULTIPLE DEPENDENT CLAIM PRESENTED			+130=	$ 0	+ 260=	$		
			TOTAL	$ 385	TOTAL	$	$	$

☐ Please charge my Deposit Account No. 12-1216 in the amount of $.

☒ A check in the amount of $385.00 is enclosed.

☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 12-1216. A duplicate copy of this sheet is enclosed.
- ☒ Any additional filing fees required under 37 CFR 1.16.
- ☒ Any patent application processing fees under 37 CFR 1.17.

Respectfully submitted,

LEYDIG, VOIT & MAYER, LTD.

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S P E C I F I C A T I O N

To All Whom It May Concern:

Be it known that We, DALE HUNSBERGER, a citizen of the United States, residing at 6097 Dana Drive, Rockford, Illinois 61109; JULIE HARWATH, a citizen of the United States, residing at 6781 South Lowden Road, Oregon, Illinois 61061; and FRANK HARWATH, a citizen of the United States, residing at 6364 Condon Road, Stillman Valley, Illinois 61084, respectively, have invented a certain new and useful **SOUND ATTENUATING MOTOR END SHIELD**, of which the following is a specification.

SOUND ATTENUATING MOTOR END SHIELD

Cross-Reference to Related Application

This application claims the priority date benefit of U.S. Provisional Patent Application Serial no. 60/024,014, filed on August 15, 1996, pursuant to 37 CFR § 1.78(a)(3).

Field Of The Invention

The present invention generally relates to hydraulic pump-motors, and more particularly relates to hydraulic pump-motor housings.

Background Of The Invention

In a typical hydraulic pump-motor, an electric motor is provided to drive a hydraulic pump and increase the pressure of the hydraulic fluid processed through the pump. By varying the hydraulic load, the resulting output pressure of the hydraulic fluid is correspondingly varied and a broad range of pressures is obtainable.

However, the operation of the motor and pump results in considerable vibration of the pump-motor unit, which is communicated to the end shield of the motor and ultimately to those in the vicinity of the pump-motor in the form of noise. The shape and position of conventional motor end shields, as well as the material from which the end shields are typically manufactured, have contributed to a drum-like effect in that the end shield reverberates during operation and thereby produces considerable acoustic output. This problem is accentuated when the pump is of a reciprocating type in that with each movement of the piston a pulse is generated, and this pulsating output

is transmitted to the end shield of the motor. Since such pump-motors are commonly used in commercial applications, e.g., dental chairs, cosmetology chairs, and hospital beds, this output noise has been the source of substantial annoyance and dissatisfaction.

The prior art has typically employed a standard die cast aluminum end shield which provides little, if any noise attenuation. Some improvement has been attained by making the end shield of cast iron as opposed to aluminum. Given the natural frequency of these metals and the frequency with which pump-motors vibrate, as well as the planar shape of typical end shields, these end shields have proven to have inadequate sound deadening characteristics and, in fact, act much like a drum as the pump-motor operates.

In an effort to improve noise reduction, the standard die case aluminum end shields of typical pump-motors have been replaced by specially shaped cast iron, plastic, or other material end shields. Given the natural frequency and sound deadening effects of such shapes, this design has provided improved sound reduction, but even greater reduction in acoustic output is desirable.

Moreover, typical end shields are secured to the motor via the same bolts which hold the stator of the motor in place. Therefore the end shield must be made from a material with sufficient strength to provide a good clamping surface for the stator screws. However, materials with good sound antenuation qualities often do not have sufficient strength to provide a good clamping surface. In addition, since the same screws which hold the stator in place also hold the end shield in place, the prior art has had difficulty in accurately measuring the air gap between the rotor and stator, after the end shield has been fastened to the motor.

Summary Of The Invention

It is a primary aim of the present invention to provide an end shield for a hydraulic pump-motor with improved sound attenuation characteristics.

An objective of the present invention is to provide a motor end shield which reduces sound output, while it increases the ease of motor assembly by allowing the end shield to be installed after the motor air gap is accurately measured.

A further objective of the present invention is to provide a pump-motor with reduced production and maintenance costs.

A still further objective of the present invention is to provide an improved method of assembling a pump having a sound attenuating end shield

In accordance with these and other aims and objectives of the present invention, a hydraulic pump-motor end shield is provided having multiple embodiments, wherein each embodiment improves the motor attenuation characteristics of known motor end shields, and which facilitates the efficient and accurate assembly of the motor-pump unit. Each of the end shield embodiments disclosed herein provides an end shield manufactured from a sound deadening material such as cast iron or plastic to thereby reduce the acoustic output of the pump-motor. With certain embodiments disclosed herein a metal outer ring is utilized in order to provide a good clamping surface to securely hold the motor stator in place and to assist in maintaining the torque of the stator screws. A plastic motor end shield is then fastened to the metal outer ring. The metal outer ring also helps to deaden sound by separating the plastic shield from direct contact with the vibrating motor housing.

In another embodiment, the metal outer ring is secured to the motor stator with a single plastic motor

end shield secured to the motor outer ring via screws other than the stator screws. This provides a cost effective method for reducing the acoustic output of the pump-motor.

In another embodiment, the motor end shield is comprised of two plastic disks which are fastened together at a central location and which are dimensioned to grip near the inner diameter of the outer motor end ring. Therefore, the outer motor end ring need not be removed in order to remove the plastic end shield. Rather, the lower end shield disk is provided with a plurality of radially protruding tabs, and the outer motor ring is provided with a corresponding number of grooves into which the tabs of the lower disk fit. To secure the end shield to the motor, the disk tabs are aligned with the ringed grooves, and the end shield is then rotated such that the disk tabs engage the bottom surface of the motor ring and sandwich the motor ring between the disk tabs and the top disk. This alternative not only provides sound attenuation, but also provides easier motor assembly in that the motor air gap between the rotor and stator can be accurately measured and secured, and the motor end shield can then be fastened to the motor.

In a still further embodiment, the lower plastic disk is provided with elastically deformable, radially disposed, legs which can be elastically deformed to engage the lower surface of the outer metal ring, while the top disk engages the top surface of the outer metal ring.

These and other aims, objectives, and features of the present invention will become apparent from the following detailed description when taken in conjunction with the accompanying drawings.

Brief Description Of The Drawings

FIG. 1 is a sectional view of a first embodiment of the present invention;

FIG. 2 is a sectional view of a second embodiment of the present invention;

FIG. 3 is a top view of a third embodiment of the present invention;

FIG. 4 is a sectional view taken along line 4-4 of FIG. 3;

FIG. 5 is a sectional view of a fourth embodiment of the present invention;

FIG. 6 is a top view of the embodiment shown in FIG. 5;

FIG. 7 is a sectional view of the end shield and motor ring of the fourth embodiment taken along line 7-7 of FIG. 6;

FIG. 8 is a top view of a fifth embodiment of the present invention.

FIG. 9 is a sectional view of the fifth embodiment taken along line 9-9 of FIG. 8.

While the present invention will be described and disclosed in connection with certain preferred embodiments and procedures, it is not intended to limit the invention to those specific embodiments disclosed. Rather it is intended to cover all such alternative embodiments and modifications as found within the sphere and scope of the present invention.

Detailed Description Of The Preferred Embodiments

Referring now to the drawings, and in particular to FIG. 1, the first embodiment of the present invention is shown in cross-section. As shown, pump-motor 10 includes motor 12 and pump 14 with motor 12 including stator 16 and rotor 18. Rotor 18 is mounted, as is conventional, within stator 16 with air gap 20 therebetween and includes shaft 22 which extends from rotor 18 into pump 14. Motor 12 is peripherally

surrounded by motor housing 26 and is bounded on one end by pump body 24. Pump body 24 includes central hub 25 through which shaft 22 is rotatably mounted. Central hub 25 also includes seal assembly 28 which protects motor 12 from contaminates and fluid being communicated from pump 14.

Pump 14 is of a conventional gear pump design having pump cavity 29 formed by pump cover 30 and pump body 24. Pump 14 is provided with a gear set 32 which compresses in-flowing fluid and discharges fluid at an increased pressure. The gears of gear set 32 are provided motion through shaft 22 as rotor 18 rotates within stator 16.

The end of pump-motor 10 opposite pump 14 is closed by end shield 34, which in the first embodiment shown in FIG. 1, is secured to pump 10 by stator screws 36. Screws 36 extend through stator 16 and are secured to pump body 24. As best shown in FIG. 1, the first embodiment provides a unitary end shield 34 comprised of planar member 38. Planar member 38 is preferable manufactured of cast iron, but could be manufactured of materials having similar natural frequencies and sound deadening qualities.

To increase the sound attenuation characteristics of end shield 34 of the first embodiment, central mass 40 is provided integral with planar member 38. Central mass 40 disrupts the planar shape of member 38 and therefore diminishes the drum-like effect. Planar member 38 is also provided with apertures 42 through which stator screws 36 penetrate, and outer diameter 44 which is dimensioned to correspond to the outer diameter of motor housing 26.

Referring now to FIG. 2, the second embodiment of the present invention is shown in cross-section. It is to be understood that where similar elements are provided throughout the several embodiments, identical reference numerals are used to depict the same elements.

Unlike the first embodiment, the second embodiment is not of a unitary design, rather it is comprised of several components. The second embodiment includes outer ring 46, preferably manufactured from steel, and end shield 34. End shield 34 is comprised of top disk 50 and bottom disk 52 which are secured together by screw 54, nut 56 and washers 58. In lieu of screw 54, nut 56, and washers 58, top disk 50 and bottom disk 52 could be secured together by a rivet or a similar fastening mechanism.

To ensure proper placement of the elements, outer ring 46 is provided with circumferential lip 60 and annular ridge 62. As shown in FIG. 2, circumferential lip 60 fits over the outer diameter of motor housing 26 to prevent outer ring 46 from moving in a direction transverse to shaft 22. Top disk 50 and bottom disk 52 span across outer ring 46 to completely cover the end of motor 12. With the second embodiment top disk 50 and bottom disk 52 are secured to outer ring 46 prior to securing the components to motor 12. End shield 34 is assembled by sandwiching outer ring 46 between top disk 50 and bottom disk 52 and tightening nut 56 onto screw 54.

To ensure proper placement of top disk 50 and bottom disk 52 relative to outer ring 46, annular ridge 62 is provided in outer ring 46 to prevent movement of top disk 50 and bottom disk 52 in a direction transverse to shaft 22. Once top disk 50 and bottom disk 52 are secured to outer ring 46, outer ring 46 is secured to motor 12 by stator screws 36 which penetrate through screw apertures 48 provided in outer ring 46.

Turning now to FIGS. 3 and 4, the third embodiment of the present invention is depicted and the method by which the third embodiment is assembled will be described. As best shown in FIG. 3, the motor and pump are identical to the first and second embodiments with the differences centering on end shield 34. In the

third embodiment end shield 34 is comprised of outer ring 64 and end cap 70. To ensure proper placement of outer ring 64 on motor 12, outer ring 64 is provided with four downwardly depending fingers 66 as best shown in FIG. 4. Fingers 66 are positioned to frictionally engage the inner diameter of motor housing 26 as best shown in FIG. 3.

End cap 70 is preferably manufactured from plastic such as nylon or polypropylene, and outer ring 64 is preferably manufactured from steel. As best shown in FIG. 3, end cap 70 has a diameter sufficient to span across motor housing 26 and is provided with recesses 68 which align with stator screws 36 as best shown in FIG. 4. The third embodiment allows the outer ring 64 to be installed prior to the installation of plastic end cap 70. Outer ring 64 is secured to motor 12 via stator screws 36. This allows outer ring 64 to be secured and air gap 20 to be precisely measured prior to installation of plastic end cap 70. Moreover, the strength of steel outer ring 64, provides a good clamping surface to securely hold stator 16 in place, and assists in maintaining the torque of stator screws 36. Once air gap 20 is measured and, outer ring 64 is secured in place, end cap 70 is secured to outer ring 64 by end cap screws 72.

Referring now to FIGS. 5-7, the fourth embodiment of the present invention is shown the method by which the fourth embodiment is assembled will be described. The fourth embodiment is similar to the second embodiment in that outer ring 80 is sandwiched between top disk 76 and bottom disk 78. Top disk 76 and bottom disk 78 are secured together via rivets 79. However, given the design of the fourth embodiment, outer ring 80 can be secured to motor 12 prior to the installation of top disk 76 and bottom disk 78 to allow air gap 20 between rotor 18 and stator 16 to be precisely measured prior to the installation of top disk 76 and bottom disk

78. With specific reference to FIG. 6, bottom disk 78 is shown having four radial flaps 88 which are adapted to align with four slots 84 provided in outer ring 80. Once flaps 88 of bottom disk 78 are aligned with slots 84, and top disk 76 comes in contact with the top edge of outer ring 80, top disk 76 and bottom disk 78 are rotated to lock end shield 34 in place.

As best shown in FIG. 5, outer ring 80 includes a plurality of latch tabs 86 which fit between top disk 76 and bottom disk 78. Each latch tab 86 is provided with a locking edge 90 and a retaining edge 92 (Fig. 7). Locking edge 90 is provided perpendicular to latch tab 86 to provide a positive stop to disk flaps 88 as bottom disk 78 is rotated into the locked position. Once bottom disk 78 is rotated to the locked position, retaining edge 92 engages disk flaps 88 to temporarily retain bottom disk 78 in the locked position until sufficient torsional force is applied to top disk 76 and bottom disk 78 to rotate bottom disk 78 out of the locked position and thereby move latch tabs 86 out of engagement with retaining edge 92. Retaining edge 92 is preferably provided at a 30° angle from latch tabs 86, although other retaining mechanisms are possible. Also, outer ring 64 is preferably manufactured from steel and top disk 76 and bottom disk 78 are preferably manufactured from polypropylene plastic, although other materials having similar characteristics are possible.

Referring now to FIGS. 8 and 9, the fifth embodiment of the present invention is depicted and the method by which the fifth embodiment is assembled will be described. The fifth embodiment is similar to the fourth embodiment except that outer ring 100 is not provided with slots through which legs 98 fit prior to assembly. Rather, the fifth embodiment provides top disk 94 and bottom disk 96 wherein bottom disk 96 includes three legs 98 as best shown in FIG. 9 which fit below outer ring 100 to sandwich outer ring 100 between

top disk 94 and bottom disk 96 as best shown in FIG. 8. Although it three legs 98 are shown, it is to be understood that a different number of legs could be employed. Top disk 94 and bottom disk 96 are secured together by rivet 102. Given the flexible nature of polypropylene plastic, legs 98 of bottom disk 96 can be elastically deformed to fit under outer ring 100 after outer ring 100 has been secured to motor 12 by stator screws 36. Outer ring 100 includes countersinks 104 to receive the heads of stator screws 36. This design enables air gap 20 to be measured, and stator 16 to be secured in place prior to the installation of top disk 94 and bottom disk 96. When it is desired to access the interior of pump-motor 10, top disk 94 and bottom disk 96 can be similarly removed.

In operation, each of the embodiments disclosed herein provides improved sound attenuation characteristics through the use of plastic or cast iron end shields 34. Since the natural frequencies of these materials do not correspond to the frequency with which pump-motor 10 vibrates, the vibrational energy imparted by motor 12 and pump 14 is substantially deadened by end shield 34 to thereby reduce the acoustic output of pump-motor 10.

With the first embodiment, the end shield of cast iron having central body 40 provides additional mass to endshield 34 to disrupt any potential reverberation. With embodiments 2-5, end shield 34 is manufactured from plastic, either one or two pieces, which is attached to an outer motor end ring. The outer end ring is separate from the motor housing to provide a surface to which stator screws 36 can be clamped, and air gap 20 can be measured prior to installation of the plastic end shield. Since the plastic is not in direct contact with the motor housing, and has an appropriate natural frequency, the acoustic output of pump-motor 10 is reduced.

Additionally, embodiments 3-5 provide methods which improve upon the ease with which pump-motor 10 can be assembled in that they provide designs wherein air gap 20 between rotor 18 and stator 16 can be precisely measured, and stator 16 can be secured via screws 36 prior to the installation of plastic end shield 34. These embodiments therefore not only provide improved sound attenuation characteristics, but also improve upon the ease with which pump-motor 10 can be assembled and maintained.

While this invention has been described with an emphasis upon preferred embodiments, it will be obvious to those of ordinary skill in the art that variations of the preferred embodiments may be used and that it is intended that the invention may be practiced otherwise than is specifically described herein. Moreover, it is to be understood that the various features described in the various embodiments disclosed herein can be used in different combinations than those described herein. Accordingly this invention includes all modifications encompassed within the spirit and scope of the invention.

What Is Claimed Is:

1. An end shield for a hydraulic pump-motor of the type having a motor mechanically linked to a pump and a housing surrounding the pump and motor, the housing having first and second open ends, the pump closing the first open end, the end shield closing the second open end, the end shield comprising:

a metal annular ring secured to the motor housing, the ring being attached via bolts securing the motor to the housing; and

a plastic end plate secured to the metal annular ring and substantially closing the second open end.

2. The end shield of Claim 1 wherein the plastic end plate includes first and second layers, the metal annular ring being sandwiched between the first and second layers, the plastic layers being secured to the annular ring before attachment of the annular ring to the housing.

3. The end shield of Claim 1 wherein the annular ring has an outer circumference and a plurality of downwardly depending fingers positioned to frictionally engage an inner surface of motor housing.

4. The end shield of Claim 2 wherein the annular ring includes an annular ridge positioned to engage outer circumferences of the first and second layers and thereby prevent lateral movement of the end plate relative to the motor.

5. The end shield of Claim 2 wherein the first and second layers are secured together by at least one fastener.

6. The end shield of Claim 1 wherein the end plate

includes first and second layers, the second layer including a plurality of radially extending arms, the annular ring including a corresponding number of slots, the arms adapted to be received through the slots and rotated along with the first layer relative to the annular ring to removably lock the end plate in position.

7. The end shield of Claim 6 wherein the slots included plurality of raised edges to serve as locking tabs to prevent inadvertent removal of the end plate.

8. The end shield of Claim 6 wherein the first and second layers are secured together by at least one fastener.

9. The end shield of Claim 1 wherein the end plate includes first and second layers, the second layer including a plurality of elastically deformable and radially extending arms, the arms adapted to be deformed under the annular ring to secure the end plate to the motor.

10. The end shield of Claim 9 wherein the first and second layers are secured together by at least one fastener.

11. A hydraulic pump-motor, comprising:

a housing enclosing a motor mechanically linked to a pump, the housing having a substantially cylindrical shape, the pump closing one open end of the housing; and

an end shield closing an end of the housing opposite the pump, the end shield being manufactured from a sound attenuating material.

12. The hydraulic pump-motor of Claim 11 wherein the sound attenuating material is cast iron, the cast

iron end plate having a substantial mass disposed centrally and extending into the housing.

13. The hydraulic pump-motor of Claim 11 wherein the sound attenuating material is plastic, the plastic end plate having a substantial mass disposed centrally and extending into the housing.

14. The hydraulic pump-motor of Claim 11 wherein the sound attenuating end shield is manufactured from a metal outer ring rigidly attached to the housing, and a plastic plate attached to the metal outer ring.

15. The hydraulic pump-motor of Claim 11 wherein the sound attenuating end shield is manufactured from a plastic outer ring rigidly attached to the housing, and a plastic plate attached to the plastic outer ring.

16. A method of assembling an end shield to a hydraulic pump-motor of the type having a motor mechanically linked to a pump in a housing surrounding the pump and rotor, the housing linking first and second open ends, the pump closing the first open end, the end shield closing the second open end, the method comprising the steps of:

securing an outer ring to the second open end of the housing about the circumference of the housing using fasteners which also secure a stator to the housing;

measuring and adjusting an air gap between the stator and a motor provided within the stator;

securing the end shield to the outer ring after the air gap is correctly set.

17. The method of Claim 16 wherein the end shield includes a plurality of radially inward, and downwardly depending, fingers adapted to frictionally engage an inner circumference of the outer ring to provide an

interference fit, and wherein the securing end shield step includes the step of fastening the end shield to the outer ring fasteners.

18. The method of Claim 16 wherein the end shield includes top and bottom layers wherein the top layer has an outer circumference greater than an inner circumference of the outer ring, the bottom layer includes a plurality of radially extending arms adapted to fit into a plurality of slots provided in the inner circumference of the outer ring, and the securing the end shield step includes the steps of inserting the arms into the slots and rotating the end shield such that the outer ring is placed between the arms and the top layer.

19. The method of claim 16 wherein the end shield includes top and bottom layers wherein the top layer has an outer circumference greater than the inner circumference of the outer ring, the bottom layer includes a plurality of radially extending and elastically deformable arms, and the securing the end shield step includes the step of elastically deforming the arms to extend under the outer ring such that the outer ring is placed between the arms and the end shield top layer.

Abstract Of The Disclosure

A hydraulic pump-motor having an end shield which deadens the sound generated by the pump-motor do thereby result in a quieter unit. The present invention provides a conventional hydraulic pump-motor having an electric motor coupled to a pumping mechanism wherein the motor includes an improved sound attenuating end shield design. Through the use of acoustically deadening materials such as cast iron and polypropylene plastic, the end plates of the present invention deaden the sounds stemming from the vibration of the pump-motor. In addition, the present invention provides an end shield design which allows the stator to be secured to the motor housing and the air gap between the rotor and the stator to be precisely measured prior to the installation of the end shield. The present invention therefore results in not only a quieter pump-motor but also a pump-motor with higher machining tolerances, improved efficiency, and lower production and maintenance costs.

PATENT
Attorney's Docket No. 64677

COMBINED DECLARATION AND POWER OF ATTORNEY

As below named inventor, I hereby declare that

This declaration is of the following type:
☒ original ☐ design ☐ supplemental
☐ national stage of PCT
☐ divisional ☐ continuation ☐ continuation-in-part

My residence, post office address, and citizenship are as stated below next to my name. I believe I am the original, first, and sole inventor *(if only one name is listed below)* or an original, first, and joint inventor *(if plural names are listed below)* of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SOUND ATTENUATING MOTOR END SHIELD

the specification of which:
☒ is attached hereto.
☐ was filed on as Serial No. and was amended on _____ *(if applicable)*.
☐ was filed by Express Mail No. *as Serial No. not known yet*, and was amended on _____ *(if applicable)*.
☐ was described and claimed in PCT International Application No. _____ filed on _____ and as amended under PCT Article 19 on _____ *(if any)*.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

COUNTRY	APPLICATION	DATE OF FILING (day,**month**,year)	PRIORITY CLAIMED UNDER 35 USC 119			
				YES		NO
				YES		NO
				YES		NO

I hereby claim the benefit pursuant to Title 35, United States Code, § 119(e) of the following United States provisional application(s):

PRIOR U.S. PROVISIONAL APPLICATIONS CLAIMING THE BENEFIT UNDER 35 USC 119(e)	
APPLICATION NO.	DATE OF FILING
60/024,014	August 15, 1997

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56 which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application.

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 USC 120				
U.S. APPLICATIONS		Status *(check one)*		
U.S. APPLICATIONS	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
1. 0 /				
2. 0 /				
3. 0 /				
PCT APPLICATIONS DESIGNATING THE U.S.			Status *(check one)*	
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NOS. ASSIGNED (if any)	PATENTED	PENDING	ABANDONED
4.					
5.					
6.					

DETAILS OF FOREIGN APPLICATIONS FROM WHICH PRIORITY CLAIMED UNDER 35 USC 119 FOR ABOVE LISTED U.S./PCT APPLICATIONS				
ABOVE APPLN. NO.	COUNTRY	APPLICATION NO.	DATE OF FILING (day,month,yr)	DATE OF ISSUE (day,month,yr)
1.				
2.				
3.				
4.				
5.				
6.				

As a named inventor, I hereby appoint the following attorneys to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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I hereby declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Date 8-8-97

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DECL1-6 (Rev. 3/25/97)

APPLICATION FOR LETTERS PATENT

Applicant DALE HUNSBERGER, JULIE HARWATH AND FRANK HARWATH

Title SOUND ATTENUATING MOTOR END SHIELD

Serial No. _____ Filed _____

Group No. _____

PATENT
Attorney Docket No. 64677

Applicant or Patentee: Dale Hunsberger, Julie Harwath and Frank Harwath
Serial Or Patent No.:
Filed or Issued:
For: Sound Attenuating Motor End Shield

VERIFIED STATEMENT (DECLARATION)
CLAIMING SMALL ENTITY STATUS
37 C.F.R. §§ 1.9(f) & 1.27(c) - SMALL BUSINESS CONCERN

I hereby declare that I am:

☐ the owner of the small business concern identified below:
☒ an official of the small business concern empowered to act on behalf of the concern identified below:

Name of Concern: Suntec Industries, Inc.
Address of Concern: 2210 Harrison Avenue
Rockford, IL 61125

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 C.F.R. § 121.3-18, and reproduced in 37 C.F.R. § 1.9(d), for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement: (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time, or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either directly or indirectly one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled: Sound Attenuating Motor End Shield, by inventor(s) Dale Hunsberger, Julie Harwath and Frank Harwath, as described in:

☒ The specification filed herewith.
☐ Application Serial No. , filed .
☐ Patent No. , issued .

Others Having Rights In The Invention

If the rights held by the above-identified small business concern are not exclusive, each individual, concern, or organization having rights in the invention is listed below and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 C.F.R. § 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 C.F.R. § 1.9(d), or a nonprofit organization under 37 C.F.R. § 1.9(e). (NOTE: Separate verified statements are

required from each named person, concern, or organization having rights to the invention averring to his/her/its status as a small entity.)

Name:
Address:

☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate (37 C.F.R. § 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Name of Person Signing:	Dale Hunsberger
Title in Organization:	Manager of Engineering
Address of Person Signing:	6097 Dana Drive Rockford, Illinois 61109

Dale T. Hunsberger
Signature

8-6-97
Date

SMALLSBC (Rev. 3/6/96)

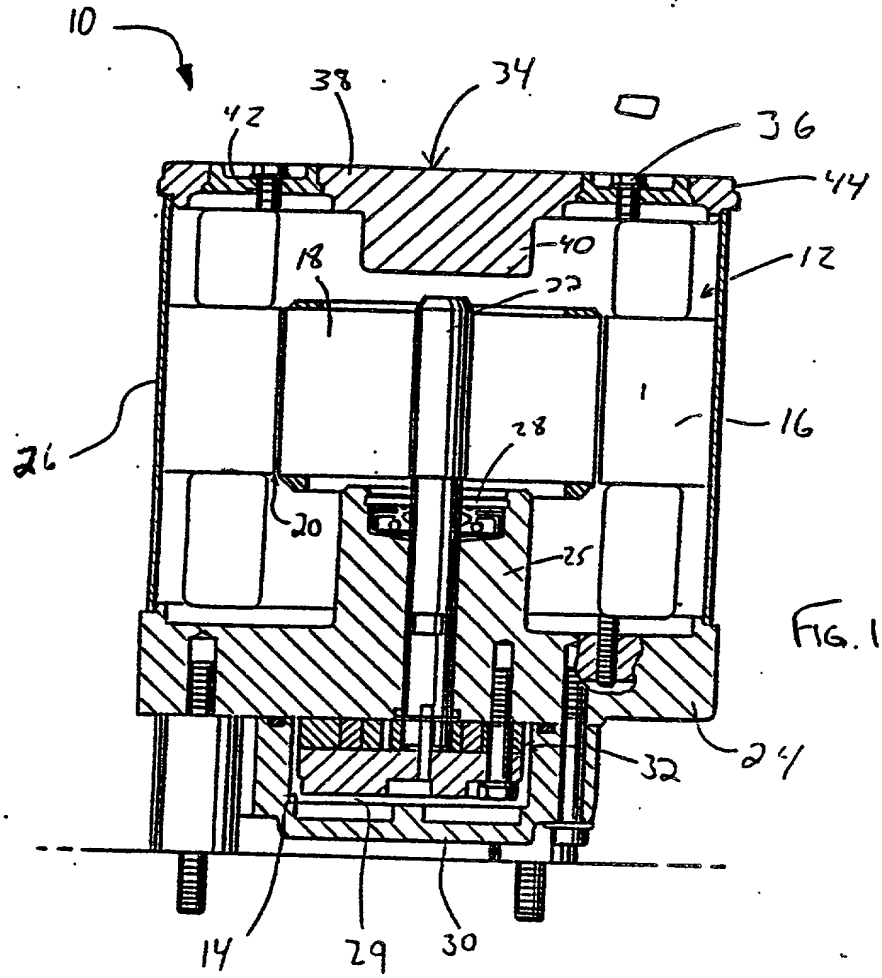
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FIG. 1

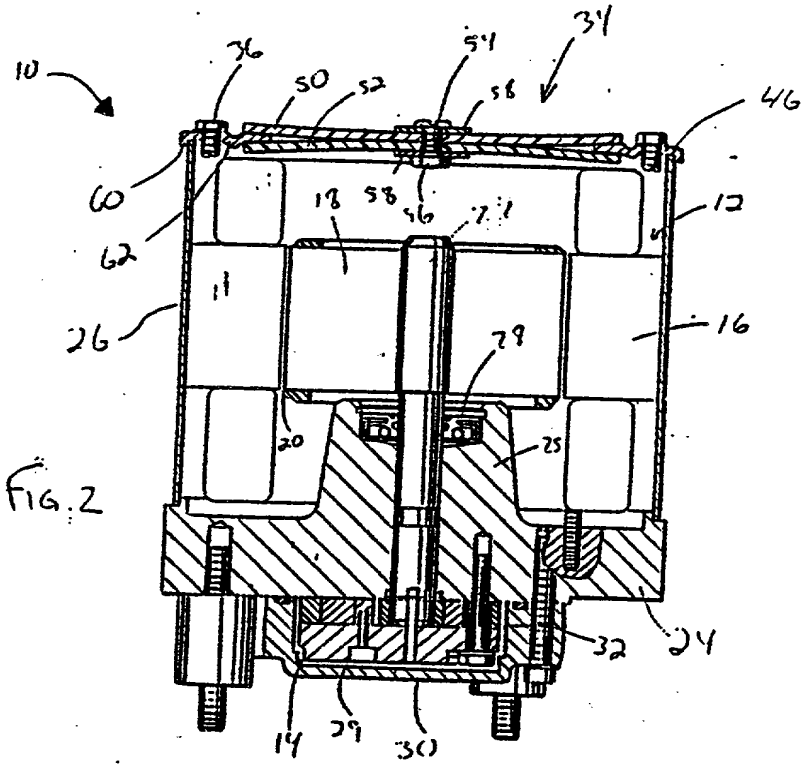
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FIG. 2

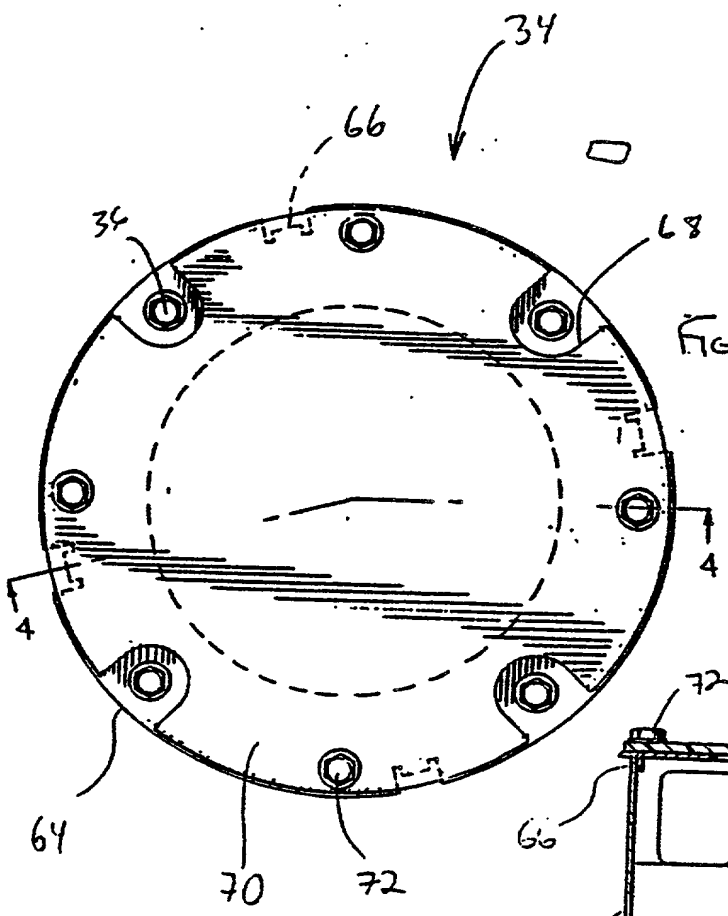

FIG. 3

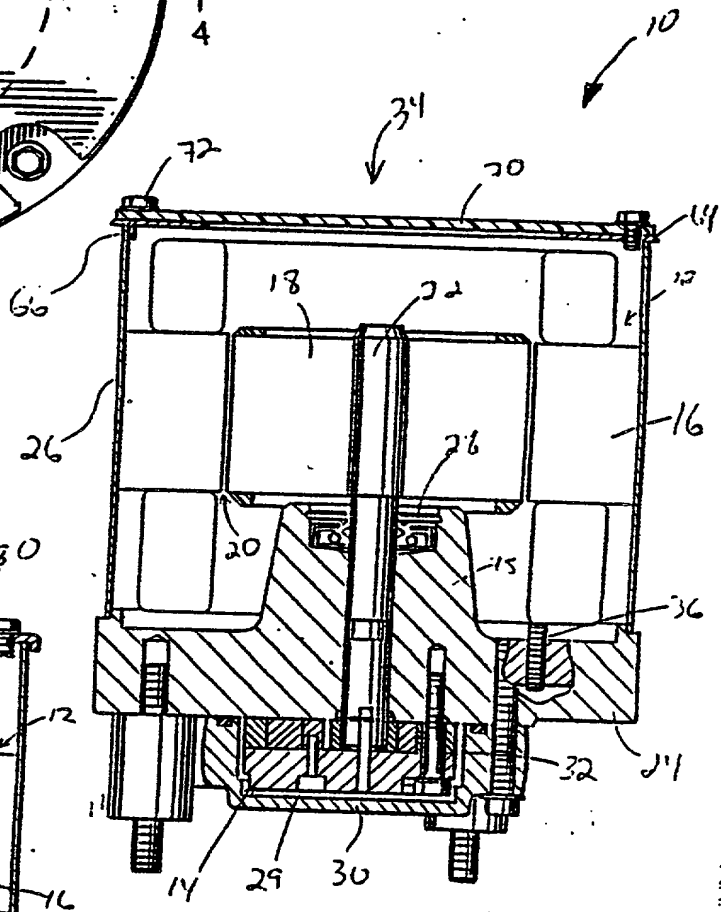

FIG. 4

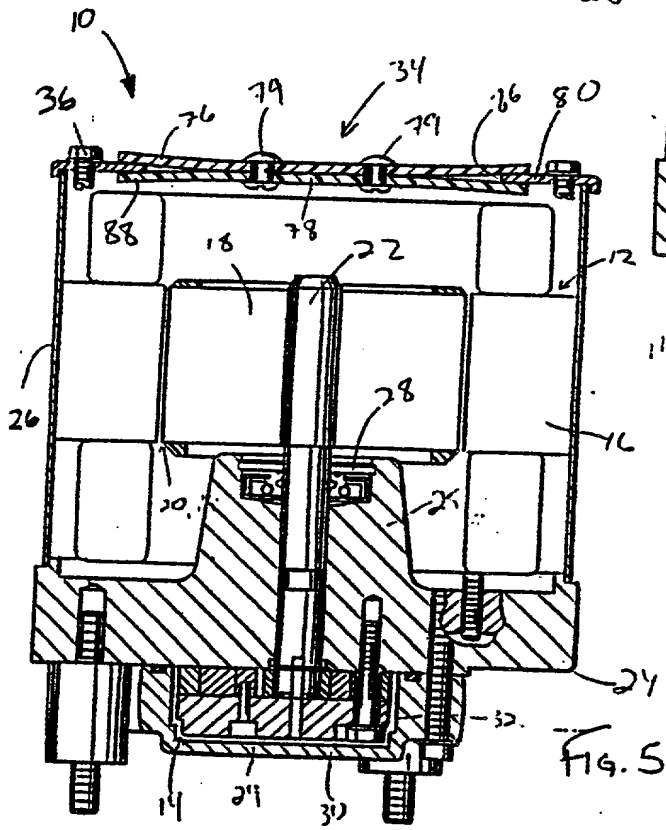

FIG. 5

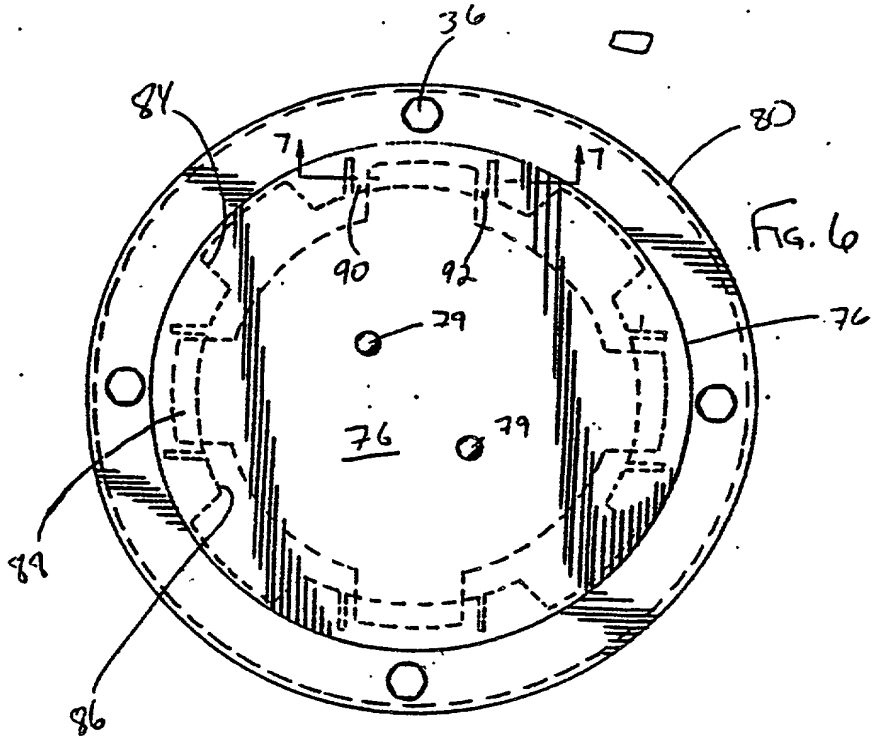

Fig. 6

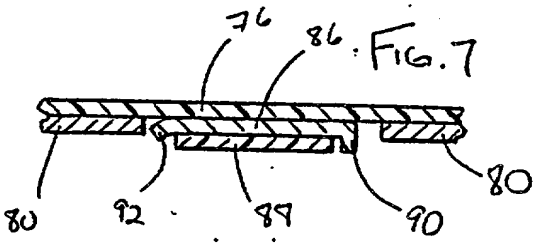

Fig. 7

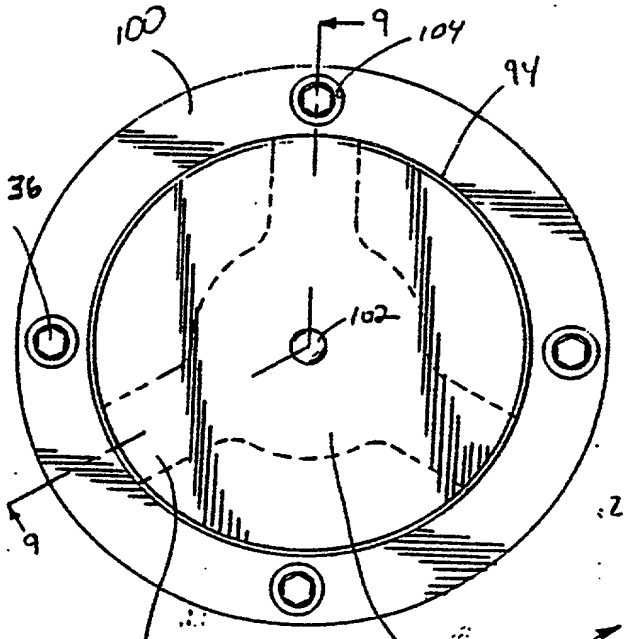

Fig. 8

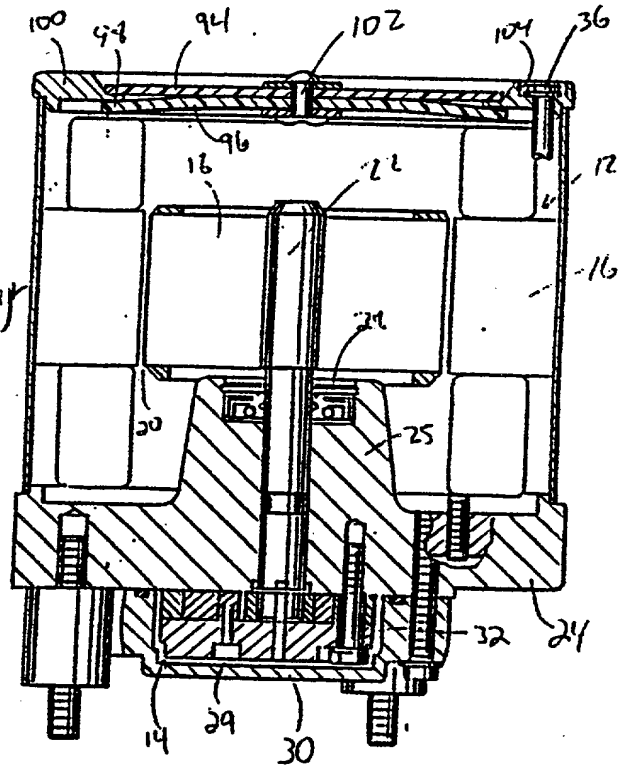

Fig. 9